



Massachusetts Water Resources Authority

North System Hydraulic Study

Wastewater Advisory Committee

November 4, 2011



MWRA Service Area

- MWRA provides wholesale water and wastewater services to over 2.5 million customers in 61 communities
- On average, MWRA delivers 220 million gallons per day to its water customers, with a peak demand of 350 million gallons
- MWRA collects and treats an average of 350 million gallons of wastewater per day, with a peak capacity of 1.2 billion gallons





Completed Projects





Somerville Marginal CSO Facility Upgrades

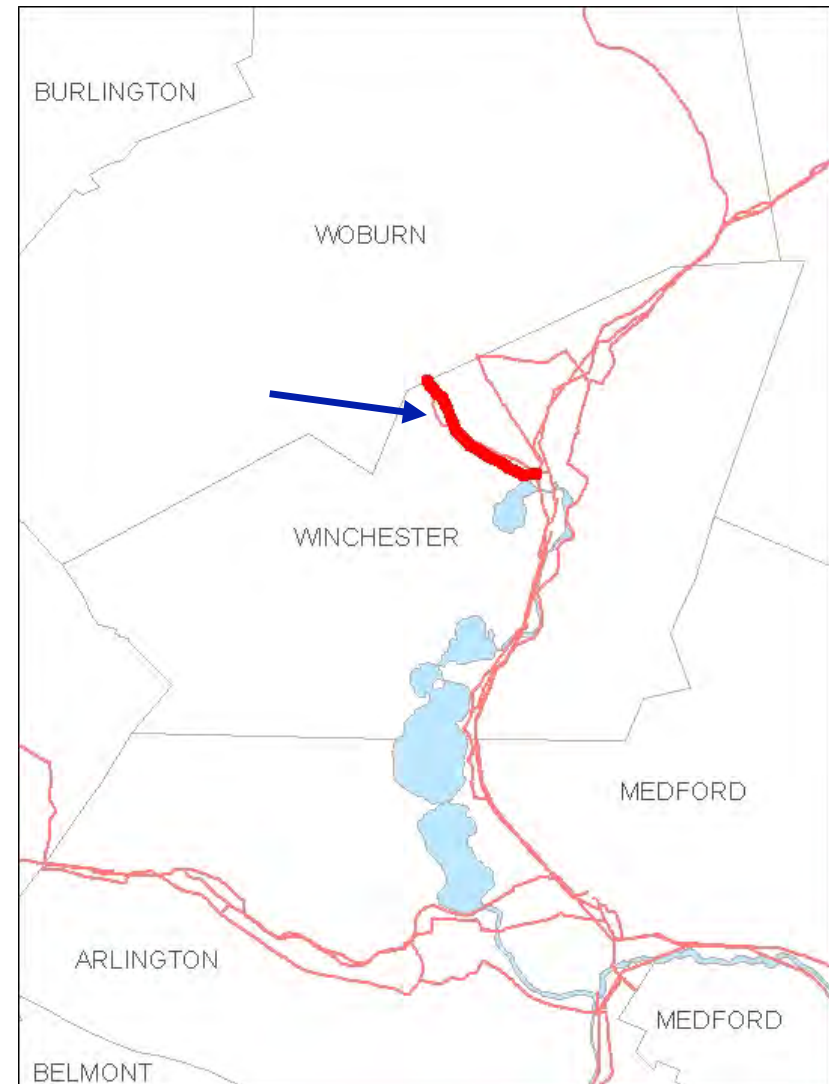
- Upgrades to the Somerville Marginal CSO Facility included construction of improved chlorination disinfection system, new dechlorination system, and new process control and safety systems
 - Completed in 2001
 - \$4 million





Cummingsville Branch Sewer

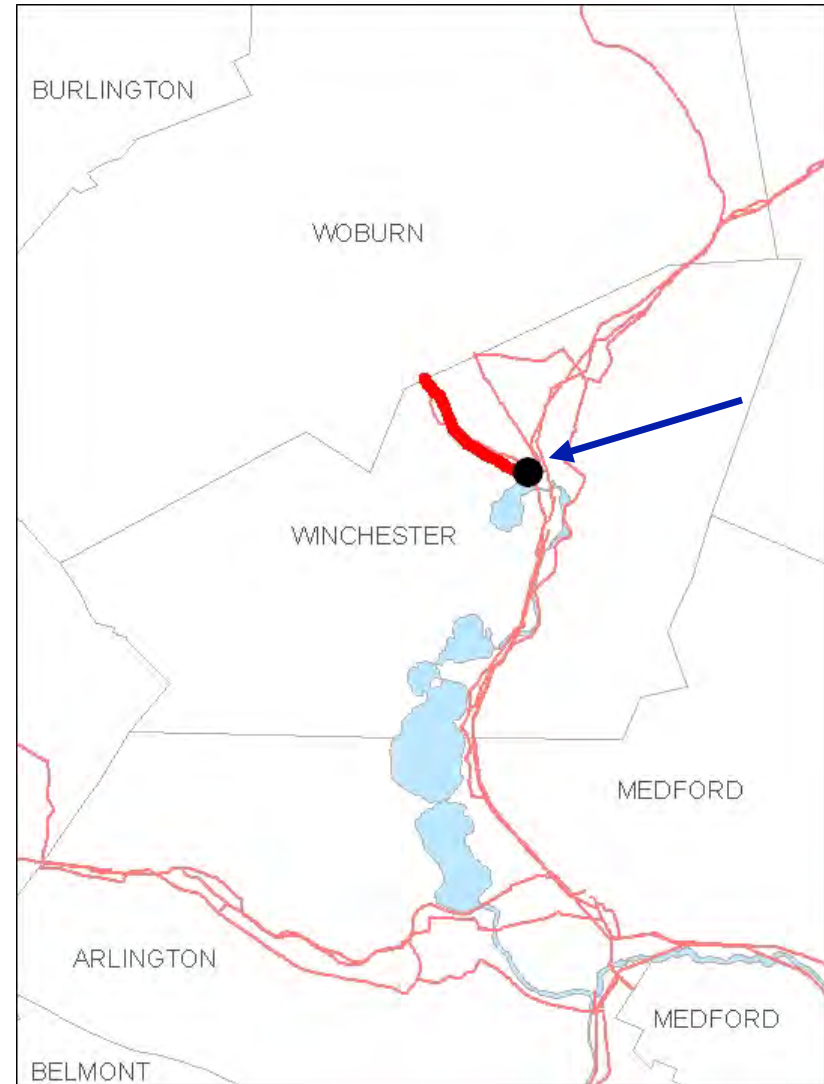
- Construction of a 4,850-foot replacement sewer and rehabilitation of 5,000 feet of sewers in Winchester to provide additional capacity to ensure adequate and reliable wastewater service for upstream communities
 - Completed 2005
 - \$4.8 million





Wedgemere Siphon

- Construction of new downstream chamber for Section 113 siphon in Winchester to alleviate historic constriction that results in chronic flooding
 - Completed 2007
 - \$1.4 million





Wedgemere Siphon: Before and After



Before

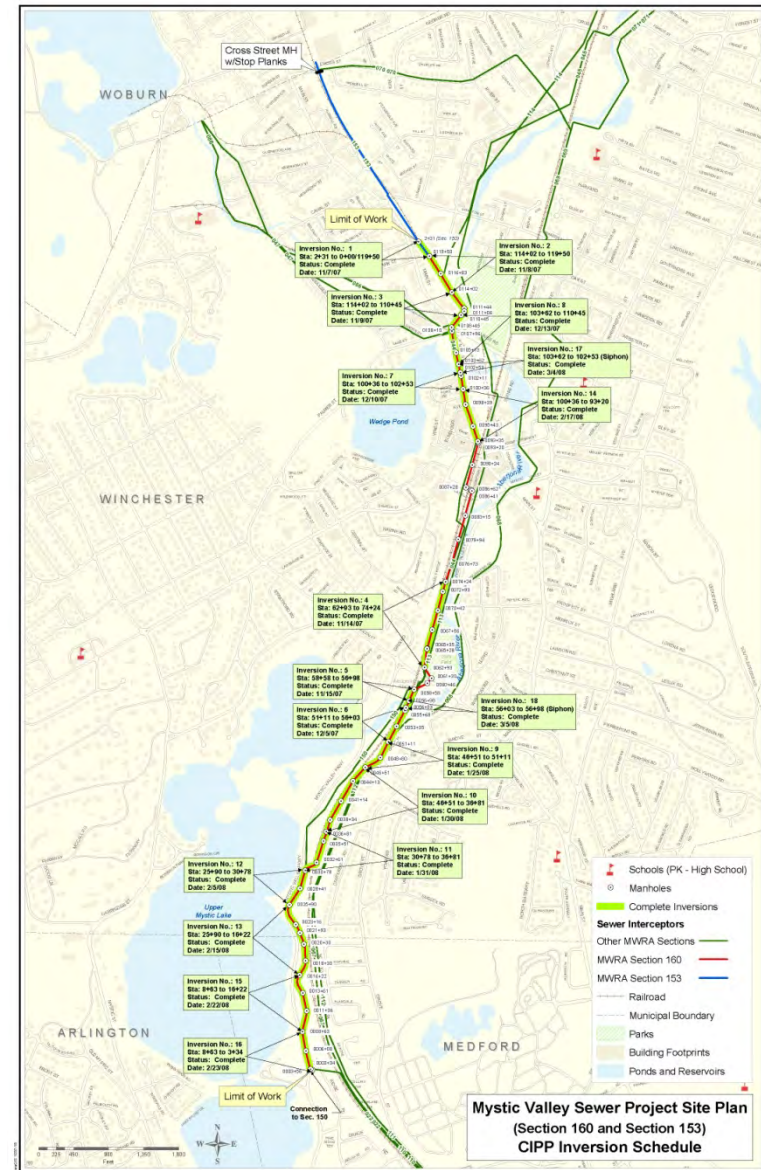
After





Mystic Valley Sewer Rehabilitation

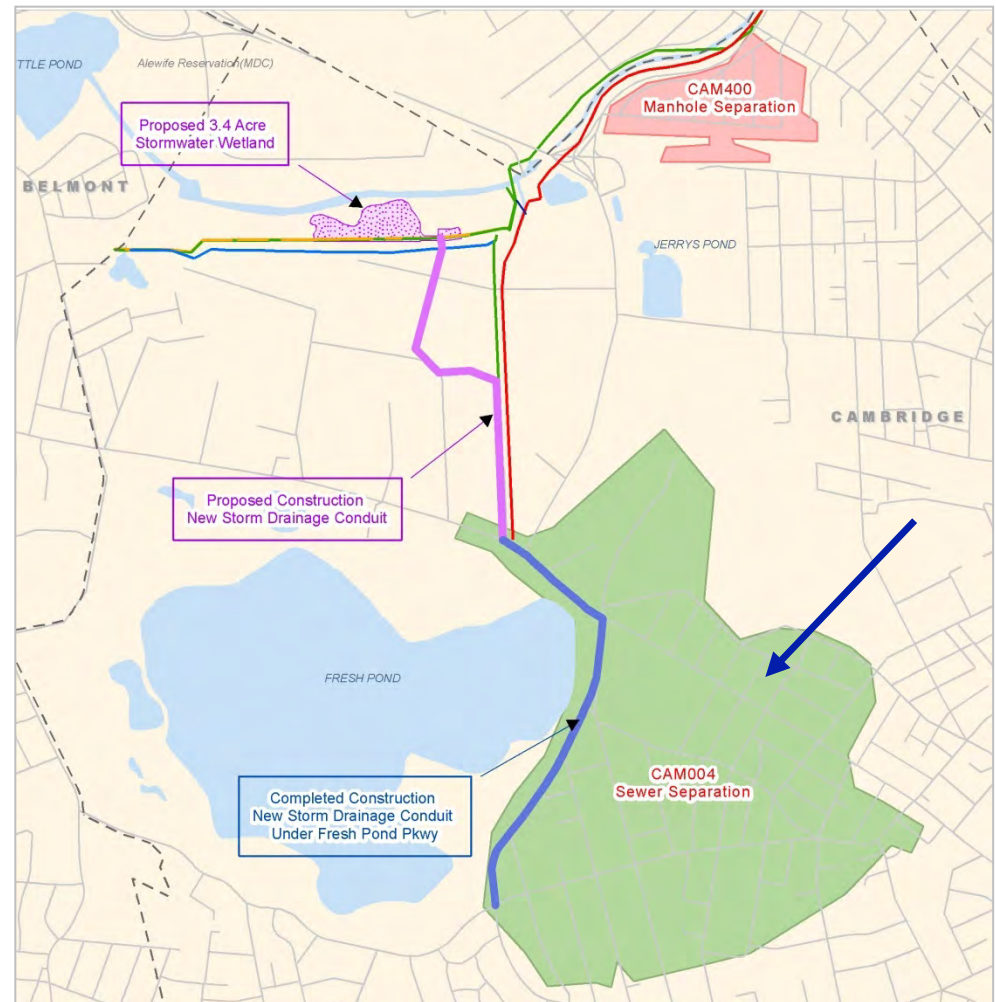
- Rehabilitation of 11,000 linear feet of Section 160 of the Mystic Valley Sewer in Winchester due to extensive deterioration of the brick and concrete sewer
 - Completed Fall 2008
 - \$1.6 million





Alewife Brook CSO Control: Sewer Separation

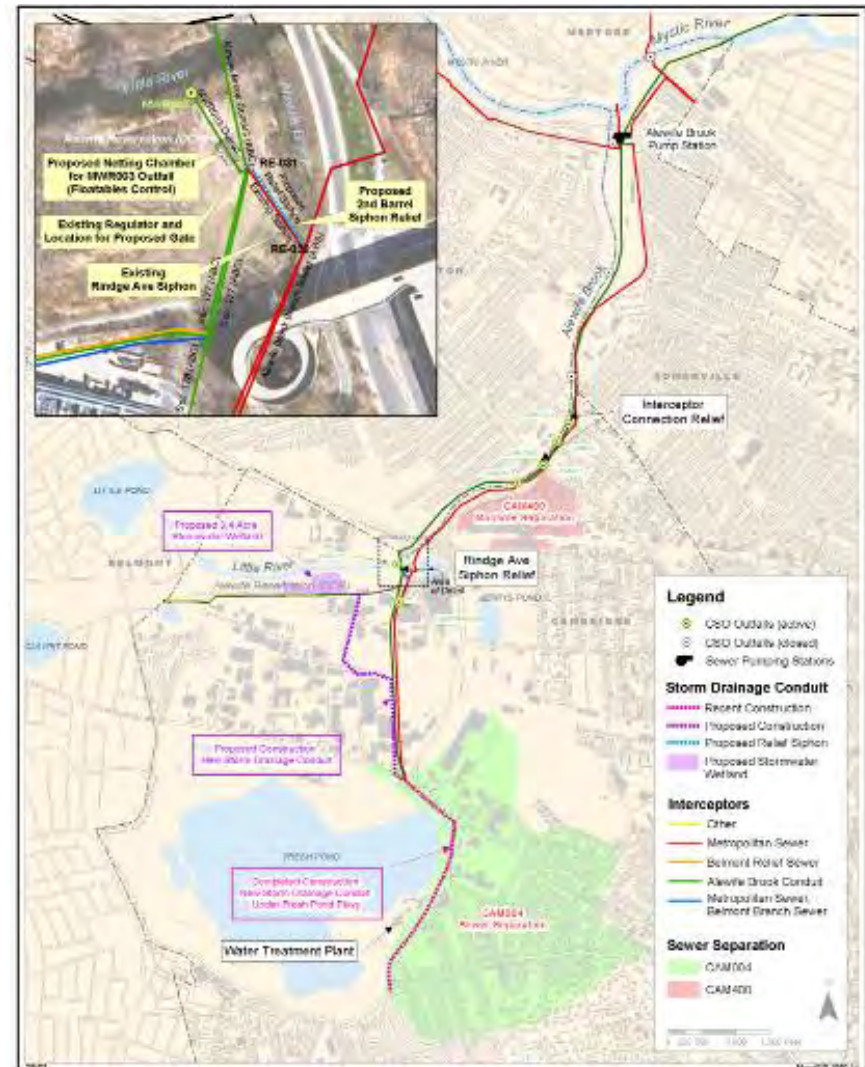
- Minimize CSO discharges to Alewife Brook by separating combined sewer systems in parts of Cambridge and upgrading local system connections to MWRA's Alewife interceptors
 - Estimated cost \$76.5 million (shared with Cambridge)
 - MWRA and Cambridge are reviewing project schedules and budgets





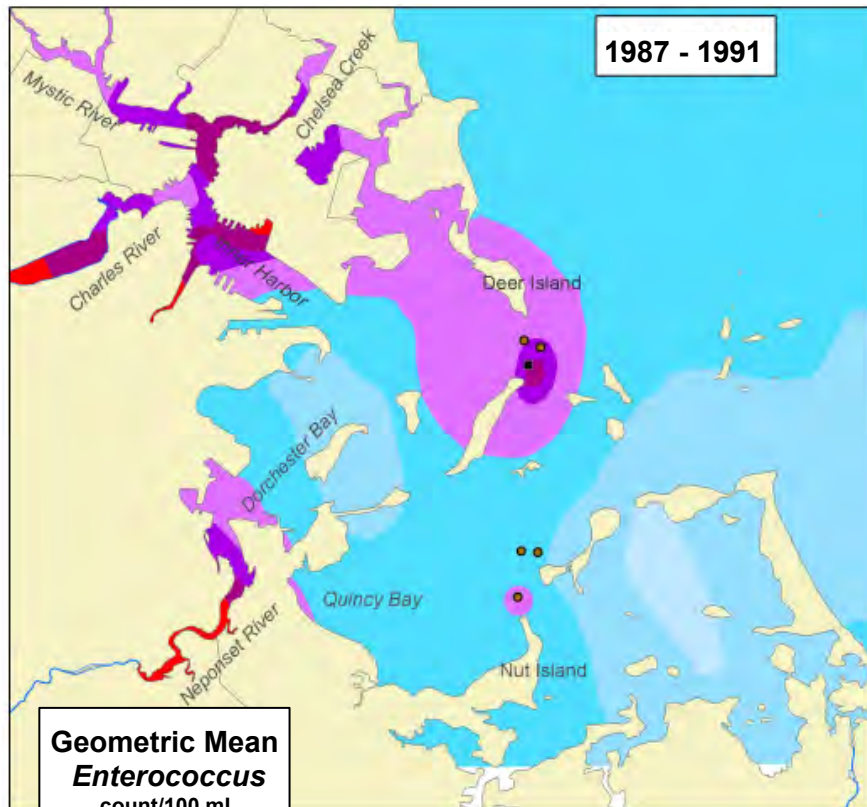
Alewife Brook CSO Control: Other Projects

- In addition to sewer separation, there are four more projects planned for Alewife Brook:
 - CAM004 Stormwater Outfall and Detention Basin
 - CAM400 Manhole Separation
 - Interceptor Connection Relief
 - MWR004 Gate and Rindge Avenue Siphon Relief
- Estimated cost \$40.6 million (shared with Cambridge)





Dramatic Improvements In Wet Weather Water Quality



The lighter the blue, the better!

SSO Rulemaking - Background

- Developed proposed rule in 2001; would
 - Require capacity, management, and O&M (CMOM) program for sanitary sewers
 - Clarify reporting and recordkeeping requirements; require public notification
 - Clarify SSO permit requirements to municipal satellite collection systems
 - Allowed the permittee to establish defenses under limited conditions
- Developed through FACA Process
- Signed by Administrator, but withdrawn prior to publication

Sanitary Sewer Overflows and Peak Flows Listening Sessions

US Environmental Protection Agency
Office of Water



Seeking Input on Seven Questions

1. Should EPA clarify its standard permit conditions for SSO reporting, recordkeeping and public notification?
2. Should EPA develop a standard permit condition with requirements for capacity, management, operations, and maintenance programs based on asset management principles?
3. What are the costs and benefits of CMOM programs and asset management of sanitary sewers?
4. Should EPA require permit coverage for municipal satellite collection systems?

Seeking Input on Seven Questions

5. What is the appropriate role of NPDES permits in addressing unauthorized SSOs that are caused by exceptional circumstances?
6. How should EPA address peak flow diversions at POTW treatment plants?
7. How should municipalities balance all of the needs to meet water quality requirements?



SSO Activity Since 2000

- 38 SSO sites
- 42% of total overflows since 2000 (57) occurred during the Feb/ March 2010 extreme weather events
- 79 overflows (over 13 rain events) since 2000 excluding Feb/ March 2010

Comparing # of overflows at each SSO site (with and without February/March 2010 storms)

# of overflows at each site	1/1/2000 to present	Same period less Feb/Mar 2010 storms
1	15	12
2	7	0
3	5	4
4 to 10	8	7
> 10	3	1
Totals	38	24



March 2010 Flows and SSOs

- 14.87-inches Rainfall at Logan Airport for month
- Second Largest Monthly Rain since 1872 (3 storms)
- Monthly Flow at DITP = 725 mgd
- Peak Day Flow at DITP = 1262 mgd
- Peak Day Flow at CCHW = 351 mgd
- 150 Hours Choking (flow above 350 mgd capacity)
at CCHW
- 28 SSO Sites in North System
- 16 SSO Sites in South System



North System Hydraulic Study–Schedule

Schedule

The Authority envisions this project will be a collaborative effort between an expert engineering consultant team and MWRA staff.

- Completion of the scope of work & project advertisement – July 2011
- MWRA Board of Directors approval of Consultant selection-AECOM
- Consultant notice to proceed – November 2011
- Estimated project duration – 12 months



North System Hydraulic Study – Scope Summary

Project Goal

- To analyze the MWRA Chelsea Creek Headworks tributary area and develop recommended means for system optimization and SSO impact reduction as it relates to various areas of discharge.

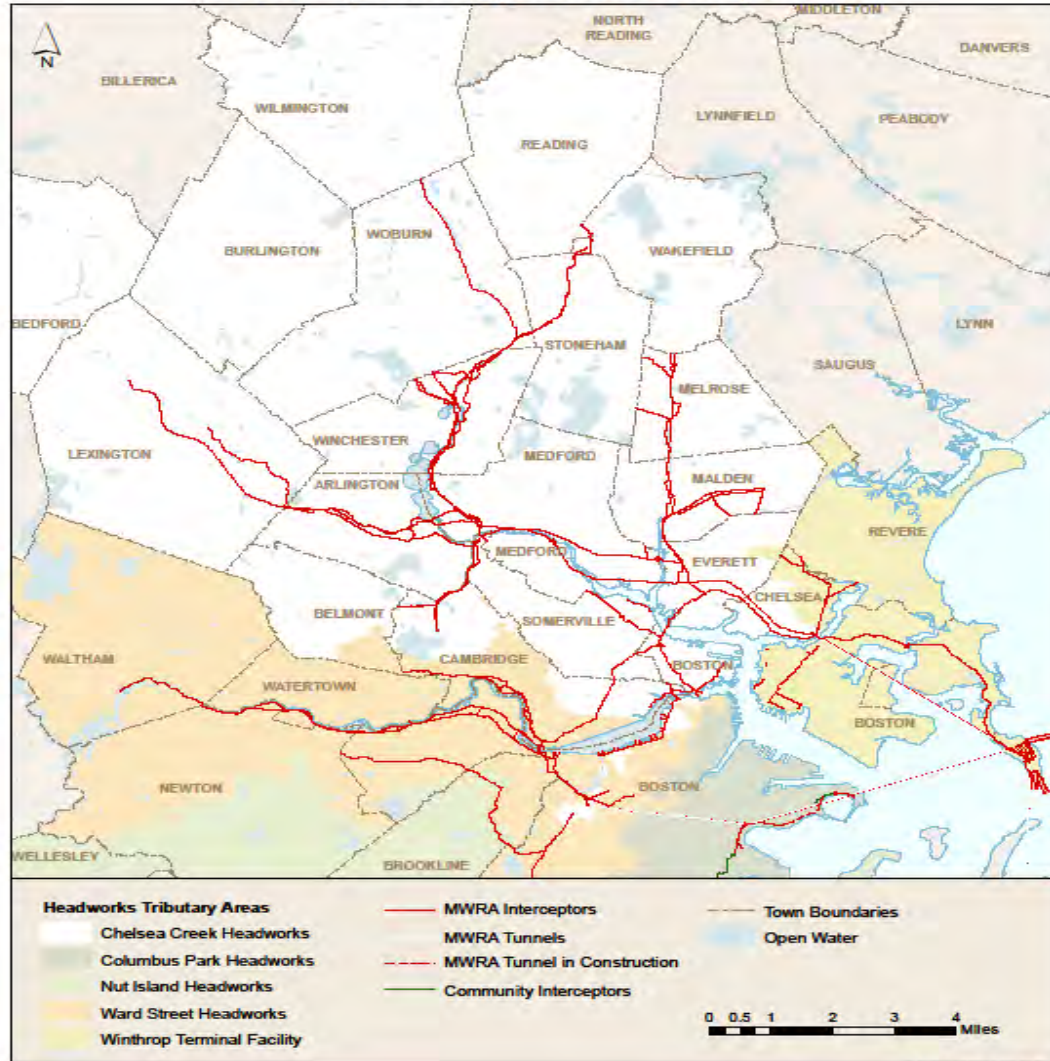
Study Area

- The study area includes the MWRA interceptor system tributary to Chelsea Creek Headworks associated with overflows to the Mystic River and its tributaries.
- This includes 18 communities and 46% of the North System flow to Deer Island (and 30% of total system flow).



North System Hydraulic Study Area

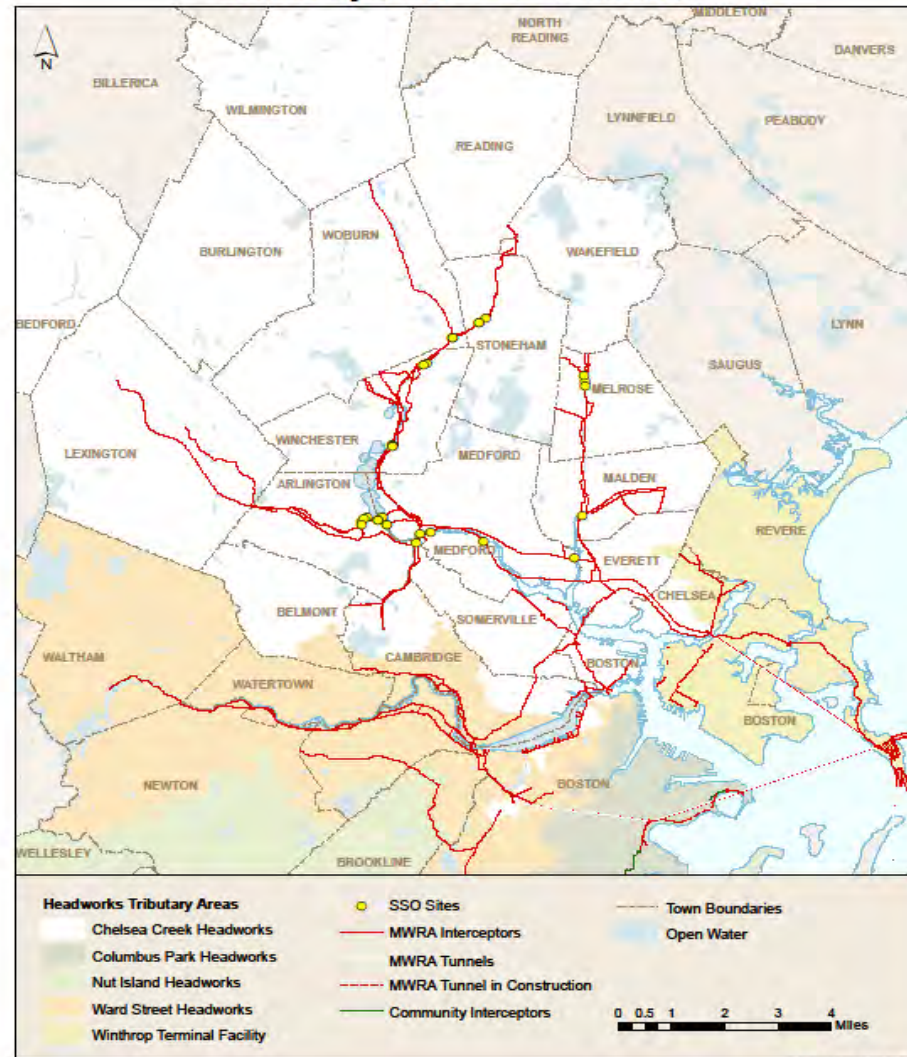
FIGURE 1
North System Hydraulic Study Area





North System SSO Locations

FIGURE 2
North System SSO Locations



7/20/2011 MWRA 15476



North System Hydraulic Study – Scope Summary

Major Tasks Outline

- The initial phase of this study is to review and confirm baseline information on system performance under a range of typical and extreme wet weather events. It will involve site visits, staff interviews, data collection, data analysis, current capacity analysis and hydraulic model refinements and baseline calibrations.



North System Hydraulic Study – Scope Summary

Major Tasks Outline

- The second phase will identify potential system operational or physical modifications or optimization opportunities to eliminate, reduce, or modify (relocate or consolidate) SSO's and improve wet weather flow conveyance. Considerations to include economic, public health impacts, water quality and operational feasibility. This phase will rely on use of the MWRA's hydraulic model. Three levels of alternatives will include: 1) system optimization measures; 2) inflow and infiltration data for the MWRA and tributary community systems; and 3) major system modifications and/or new facilities.



Task 3 - Alternatives

Alternative 1

- Evaluate **System Optimization** measures
 - Includes gates and controls, weir elevation modifications, weir removal timing, pipe interconnections, etc..

Alternative 2

- Evaluate **Major System Modifications**
 - Includes MWRA relocation or consolidation of SSOs to less sensitive locations, storage, treatment alternatives, relief or new interceptors, pump stations, etc.



Alternatives (cont.)

Alternative 3

- Evaluate **Infiltration and Inflow (I/I)** measures
 - Evaluate to what extent I/I would need to be reduced to eliminate SSOs
 - Identify significant sources of infiltration and inflow (including river flooding)

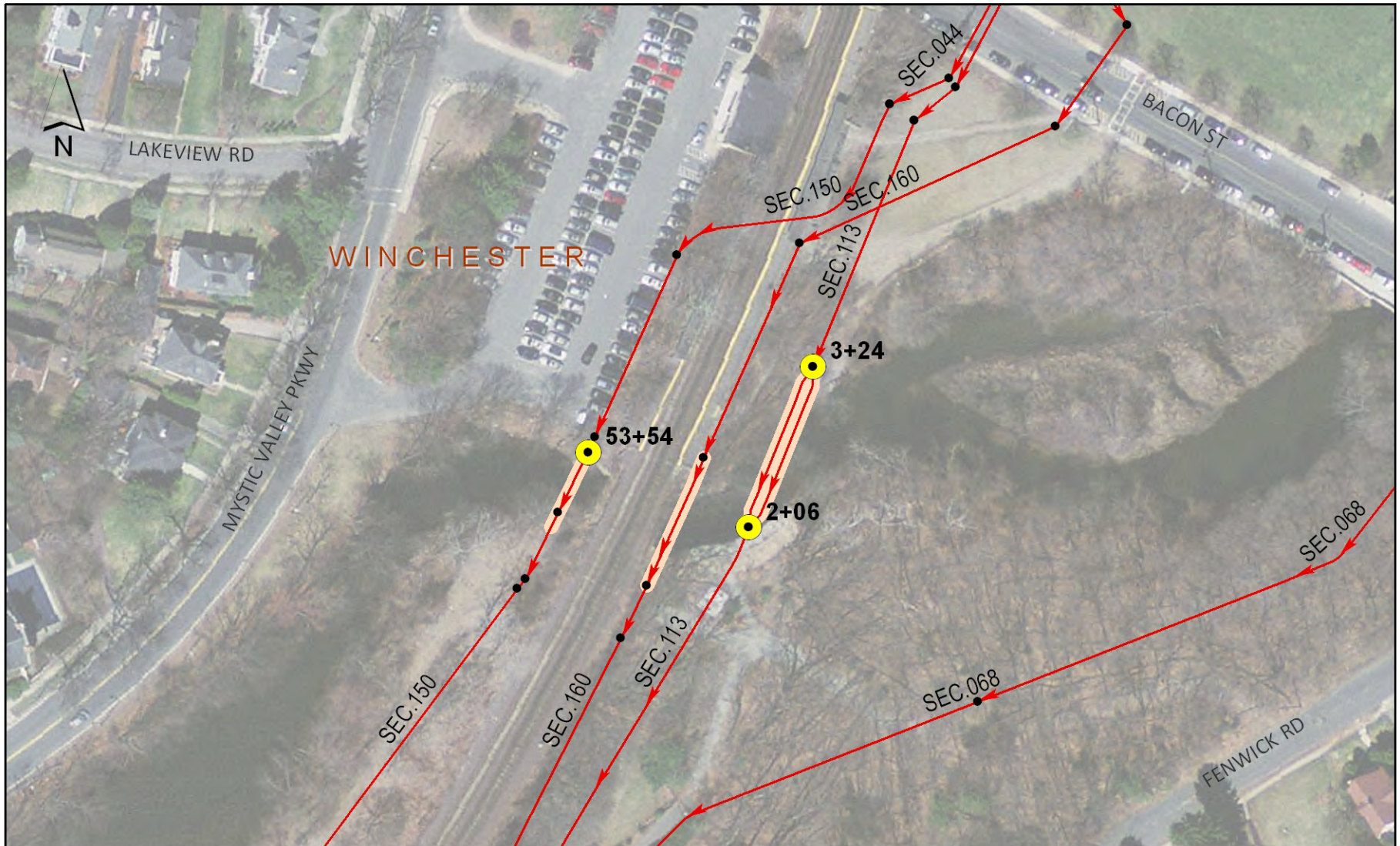


Potential Projects

System Optimization-Example

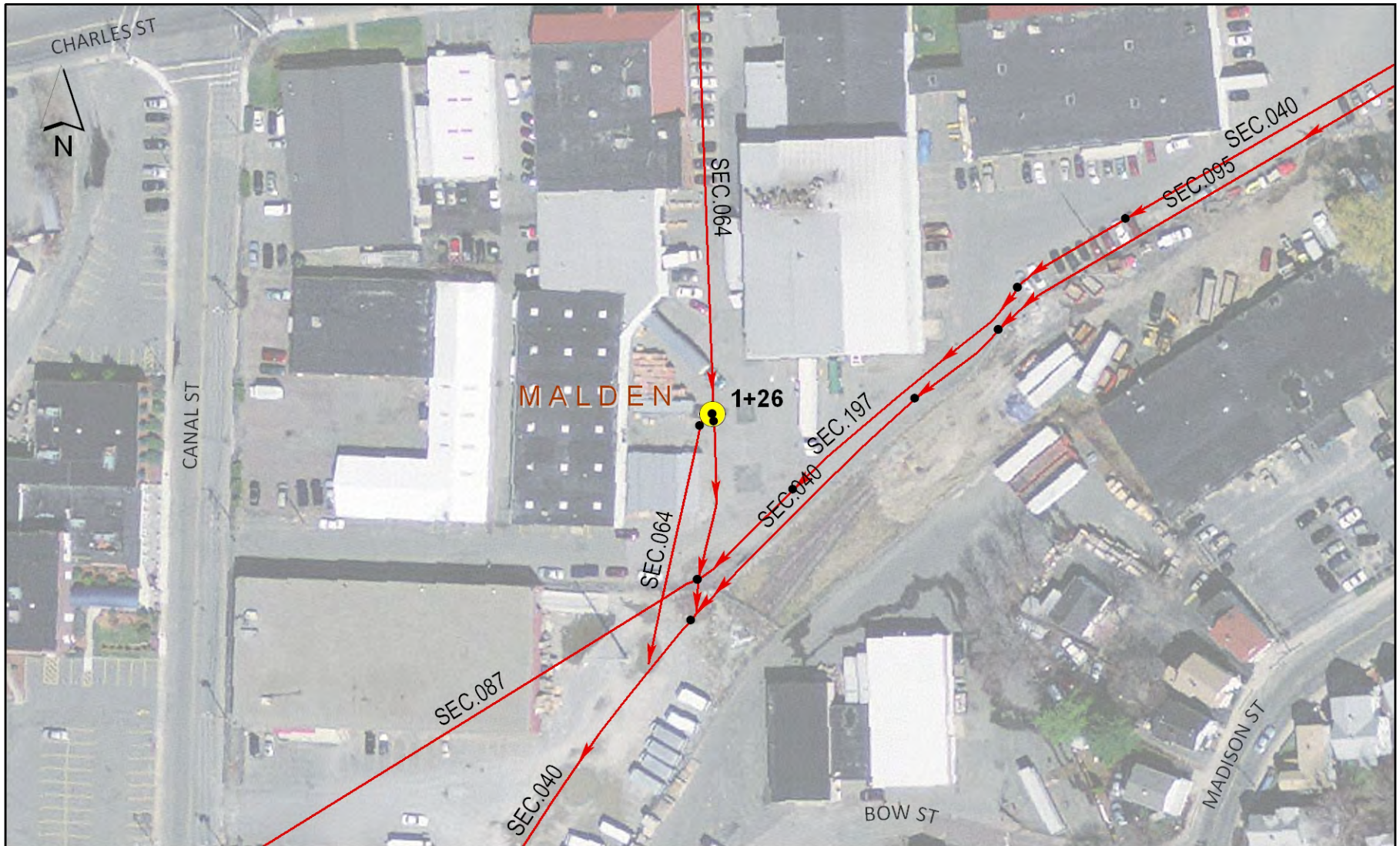
- Underflow baffles/gates
 - Evaluates the potential use of underflow baffles and/or additional gates in the system. This could provide the benefit of maximizing in-system storage and/or slow peak flow throughout the MWRA collection system.

System Optimization-Siphon Evaluations



1 inch = 100 feet

System Optimization-Relief



1 inch = 100 feet



Potential Projects

Major Modifications-Example

- SSO Consolidation
 - Construct a large relief line to intercept SSOs along the Mystic River to a location which would provide tidal dispersion and potentially provide disinfection through the Somerville CSO facility.

Major Modification-Storage



1 inch = 200 feet



Baseline Assessment Sub-tasks-Examples

- Identify appropriate field volume estimate methodology for each SSO location. Recommend a method for SSO volume calculations for each type/location of SSO.
- Prepare a summary report for each SSO location including maps, photos, elevations, receiving water body, activation frequency, volumes and durations etc.
- Develop a sensitivity analysis chart for each location that predicts the likelihood of an SSO event under varying rainfall, flooding and antecedent flow conditions.



Major Project Deliverables

- Baseline Performance Assessment and Summary Report
- System Optimization Technical Memorandum
- I/I Findings Technical Memorandum
- Major System Modifications Technical Memorandum
- Final Report



Final Report

- Recommend an overall plan to eliminate, reduce or relocate SSOs for that part of the service area tributary to Chelsea Creek Headworks based on best engineering/planning/industry practices. The plan may include a mix of SOP measures, I/I reduction and major system modifications as appropriate.
- For each potential grouping of project alternatives, discuss the overall costs and benefits, construction considerations, engineering and operational requirements, regulatory/permitting issues including water quality, and any other relevant non-hydraulic factors.



North System Hydraulic Study

- Questions?